

Regulated Transcription Of Targeted Genes And Other Biological Events

Abstract Of The Disclosure

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Sub Dimerization and oligomerization of proteins are general biological control mechanisms that contribute to the activation of cell membrane receptors, transcription factors, vesicle fusion proteins, and other classes of intra- and extracellular proteins. We have developed a general procedure for the regulated (inducible) dimerization or oligomerization of intracellular proteins. In principle, any two target proteins can be induced to associate by treating the cells or organisms that harbor them with cell permeable, synthetic ligands. To illustrate the practice of this invention, we have induced: (1) the intracellular aggregation of the cytoplasmic tail of the ζ chain of the T cell receptor (TCR)-CD3 complex thereby leading to signaling and transcription of a reporter gene, (2) the homodimerization of the cytoplasmic tail of the Fas receptor thereby leading to cell-specific apoptosis (programmed cell death) and (3) the heterodimerization of a DNA-binding domain (Gal4) and a transcription-activation domain (VP16) thereby leading to direct transcription of a reporter gene.

Regulated intracellular protein association with our cell permeable, synthetic ligands offers new capabilities in biological research and medicine, in particular, in gene therapy. Using gene transfer techniques to introduce our artificial receptors, one can turn on or off the signaling pathways that lead to the overexpression of therapeutic proteins by administering orally active "dimerizers" or "de-dimerizers", respectively. Since cells from different recipients can be configured to have the pathway overexpress different therapeutic proteins for use in a variety of disorders, the dimerizers have the potential to serve as "universal drugs". They can also be viewed as cell permeable, organic replacements for therapeutic antisense agents or for proteins that would otherwise require intravenous injection or intracellular expression (e.g., the LDL receptor or the CFTR protein).